

OPTIMIZATION OF THE LASER

Date: 20 February 1964

Declass Review by NIMA/DOD

PROJECT AUTHORIZATION REQUEST

No. 217

20 February 1964

TITLE: Optimization of the Laser

TASK/PROBLEM

Explore the production of 0.5 micron (blue-green) laser radiation by harmonic doubling in KDP and ADP crystals.

PROPOSAL

It is proposed to explore the production of 0.5 micron (blue-green) laser radiation as already demonstrated at [redacted] and other laboratories by harmonic doubling in KDP and ADP crystals. There are many factors to encourage the use of radiation in the 5000A and 6000A region in photographic systems. These are:

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- (a) Availability of a wide range of existing sensitized products for which considerable performance data is already available.
- (b) Many existing optical system designs are corrected for this wavelength range.
- (c) The possibility of using sensitized materials which may be handled under safelights.
- (d) The possibility of visual observation of the image as an aid to operation of the system.

Full advantage will be taken of the research in progress in [redacted] on "doped" borate glass lasers which provide high-energy out-put pulses at about 1 micron wavelength. The high-energy peak available from solid lasers provides much better efficiency in the harmonic doubling process than the steady-state energy situation in gas lasers. Recent technical reports suggest the possibility of operating a glass laser and a harmonic doubling element at high-repetition rate. Repeated flashing at rates above 20 to 30 cps should provide the visual effect of a continuously operating system for visual observation and equipment adjustment.

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Successful operation of the glass laser with a harmonic doubling element will be followed by the photographic tests outlined below:

1. The measurement of image quality and sensitometry for a variety of materials of appropriate color sensitivity. The list of potentially useful sensitized materials will be chosen as the project proceeds.
2. A study of interference phenomena, destruction of coherence and other physical effects upon image formation will be explored for a variety of sensitized material components and component combinations. For example, comparative tests of:
 - (a) Gray-base vs clear support,
 - (b) Pellord coated vs uncoated,
 - (c) Acetate vs polyester support, etc., will be made and studied.

Consideration of films as receptors and original image material will be included in these studies. Close correlation of this effort with that of PAR 216 will be maintained to avoid unnecessary duplication.

Assignment this project will be to a group now actively working on laser systems. Part of their effort is a continuing survey of the technical literature in the field. Information from those sources will be applied to this project where it is useful.

The objective of this program will be a final report discussing in detail all investigations and tests accomplished. Special emphasis will be placed on reporting:

1. The knowledge gained regarding the combination of a laser with a harmonic doubling crystal element as a source of coherent visible light radiation.
2. Organize data regarding use of the laser with a variety of photographic sensitized materials.
3. Recommendations regarding the breadboarding and building of prototype equipments to support the photo exploitation community.

26 January 1967

Approved For Release 2003/01/28 : CIA-RDP78B04770A002600020026-5

Contract ☐ - ACTIVE PAR TITLES AND PROPOSED CONDENSED TITLES

<u>PAR</u>	<u>Title</u>	<u>Proposed Condensed Title*</u>
202	Briefing Print Enlarger	Same as title.
203	Rapid Access Printer	Same as title.
206	Reversal Processing of High-Resolution Films Study	Reversal Processing Study
207	Definitive Study of Contact Printers	Contact Printer Study
211	Microdensitometer Study of Effects of Processing	Image Effects Study
212	Color Acquisition System Review Study	Color Acquisition Study
213	Color Reproduction Systems Review	Color Duplication Study
214	Roller Transport Reversal Processor (12-Inch)	Reversal Processor RT-12
215	Roller Transport Processor (24-Inch)	Processor RT-24
216	Exposure of Photographic Material with Lasers	Laser Photographic Exposure
217	Specialization of Lasers	Same as title.
222	Stereo Registration Systems	Stereo Registration System
223	Monochromatic Lens System	Monochromatic Lenses
224	3X - 15X Fluid Gate Enlarger	Fluid Gate Enlarger
225	Microdensitometer Training Program	Microdensitometer Training
1	Analysis of Photographic Images to Evaluate System Performance	Photographic Image Analysis

*Condensed titles are to contain a maximum of 30 characters including spaces.

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26 January 1965

Contract - PARs NOT SUBMITTED OR APPROVED, PROPOSED CONDENSED TITLES

<u>PAR</u>	<u>Title</u>	<u>Proposed Condensed Title*</u>
227	Color Exploitation/Evaluation Viewer	Color Viewer
228	Vectograph Study	Same as title.
230	10X Color Lens	Same as title.
231	10-20-40 Color Lamphouse	Same as title.
232	Automated Edge Trace Device	Automated Edge Trace Device
233	Zoom (6X to 60X) Projection Lens for Monochromatic Light	Monochromatic Zoom Lens
234	MTF Exposure Device	Same as title.
235	Automation Program Study	Automation Study
236	Film Disposal Rewind Unit	Film Scrap Unit

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[redacted]
For your info & comments.
P

PAR 217 Comments


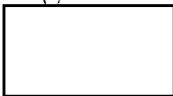
25X1

This seems to be the usual
[redacted] report. The work has
little practical value now
or in the foreseeable future
to me. I really enjoyed the
literature search! This is a
fine useable source of
reference material! Why didn't
they just say we went to
the library and looked at a
bunch of books & journals?
What in hell did we pay for?

25X1

Information is good, but I feel it
is available from other sources in
much more useful detail.
[redacted] may not be useful for
things of this kind - they
are basically engineers, do an
engineering approach - and
uncover no science.

25X1

- 1) objectives written here by  only familiar people?
- 2)  no expert in laser field
- 3) harmonic (freq.) doubling in 1 substance (inert gas eg bromine)

25X1

D.S.

25X1

Var 217 -

mo. & 4
repts:

should have known about optimum orientation
of crystal axes for 2nd harmonic output (?)

practically
overcomplicated, altered "task/problem"

inhomogeneous beam not new (?)
increase in uniformity our obj.?

why comparing beam structure of only
fundamental + 2nd harmonic? (500 + 1600 Å)

why experimentation w. harm. doubling began
before lit. search comparing it w.
other laser techniques for producing
visible, coh. illum.?

lit. search inconclusive; why regular
search not proposed + initiated
immediately?

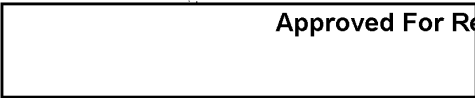
why complicated procedure by
using harm. dby. to get visible
radiation (convenience to them or to us?)
could have used visible laser
conversion efficiency problem should?

25X1



glass laser & power supply transferred
to another project" (1) so beam
uniformity not investigated fully

25X1



"Optimization of a Laser

217

(3)

31 Jan 64: See MFR, this date, regarding our requirements

3-4 Feb 64: ☐ will prepare a PAR.

10 Feb 64: See message this date authorizing writing of PAR's

20 Feb 64: Message of this date assigned PAR-217

24 Feb 64: Five copies of design objectives received.

24 Feb 64: MFR--PAR approved.

27 Feb 64: Memo requesting TWX ☐

25X1

3 Feb 64: TWX sent to ☐

25X1

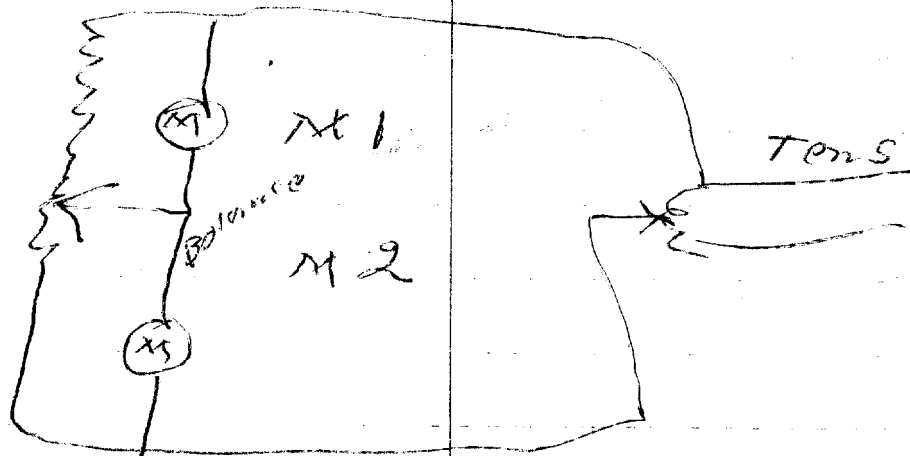
~~PAR 217~~

PAR - 217

Cyan Laser

PAR 202

~~0.5~~ 0.5 lbs per inch
Per width max.



Pict. of transp.

600 cfm [easel for
head 1 lb sgian]